# DYNAMICS AND STATISTICS OF A MICROBUBBLE JET IN MICROGRAVITY

**Pau Bitlloch[1], Jordi Carrera[2,4], Xavier Ruiz[3,4], Ricard González-Cinca[5], Laureano Ramírez-Piscina[4,5], Jaume Casademunt[1,4]**

[1] Departament d'Estructura i Constituents de la Matèria, Universitat de Barcelona

[2] NTE, SA

[3] Departament de Física Aplicada, Universitat Rovira i Virgili

[4] Institut d'Estudis Espacials de Catalunya

[5] Departament de Física Aplicada, Universitat Politècnica de Catalunya,

We present a numerical study of the collective dynamics of a bubble suspension in a turbulent jet under microgravity conditions. The study is based on a recently introduced stochastic model of bubble dispersion. In the framework of a k-epsilon model of the flow, bubble motion is decomposed into a passive component advected by the mean flow, and a diffusive random walk with an effective local diffusion coefficient which depends on the local properties of the turbulent flow [1]. Numerical simulation of this model has been satisfactorily compared with data from a campaign of experiments conducted in the 4.74 seconds Drop Tower of ZARM at Bremen, where a novel system of gas injection was recently introduced [2]. This injector is based on the creation of a slug flow at a capillary T-junction prior to injection, and generates a jet carrying a virtually monodisperse bubble suspension with a prescribed size, independent of the gravity level.

Our model predicts the probability distribution of bubbles in the jet generated by this procedure. From the corresponding simulation of bubble stochastic trajectories, we also study the probability of bubble coalescence. While bubble coalescence does not seem to be statistically very significant in experiments, quantification of the expected degree of coalescence for a given set of conditions is relevant for practical applications.

Finally some lines of possible improvement of the model are also explored, such as the effect on the overall cavity flow of the lower effective density of regions with bubbles. Our numerical analysis is adapted to the geometry and parameter ranges of a projected series of Parabolic Flight experiments to be conducted in the near future.

1 P. Bitlloch, J. Carrera, X. Ruiz, R. González-Cinca, L. Ramírez-Piscina, J. Casademunt, "Numerical Study of the Generation and Dispersion of a Bubble Jet in Microgravity", Proceedings IAF (2006).

2. J. Carrera, X. Ruiz, L. Ramírez-Piscina, J. Casademunt, M. Dreyer, "Generation of a Monodisperse Microbubble Jet in Microgravity", Preprint (2006).